32[P, X].—R. E. D. Bishop, G. M. L. Gladwell & S. Michaelson, *The Matrix Analysis of Vibration*, Cambridge University Press, New York, 1965, x + 404 pp., 26 cm. Price $19.50.

It is stated in the preface that this book "can be regarded as a sequel to an earlier volume" [R. E. D. Bishop & D. C. Johnson, *The Mechanics of Vibration*, Cambridge University Press, 1960], but that it can be read independently. Four of the chapters deal mainly with the mathematical formulation, in matrix form, of vibration. These are Chapter 2, The Vibration of Conservative Systems having a Finite Number of Degrees of Freedom; Chapter 4, Further Development of the Theory of Conservative Systems; Chapter 5, Damped Forced Vibration; and Chapter 6, Continuous Systems. The remaining five chapters can be read independently of these, and two provide a very elementary introduction to the theory of matrices, while the remaining three provide equally elementary descriptions of computational techniques.

For solving linear systems and inverting matrices, only methods of triangular factorization are discussed (Gaussian elimination with pivoting). Chapter 8 deals mainly with the power method for finding the root, with Aitken's acceleration, deflation, and some techniques for finding error bounds based mainly on the use of the Rayleigh quotient. The use of a Rayleigh-quotient iteration is implied, and could be so easily developed, that one wonders why it was not. The final chapter bears the slightly misleading (but often used) title "Direct Methods for Characteristic Values." The direct methods, of course, produce only a reduced matrix or the characteristic equation, to which it is still necessary to apply some iterative method. For symmetric matrices they choose the method that goes by the name of the reviewer; for nonsymmetric matrices they describe the Lanczos method. For the triple-diagonal matrices, they discuss Newton's method and Muller's method.

There are many exercises, and about 30 pages of detailed solutions at the end. In addition, a number of illustrative examples are worked out in the text. The complete novice to matrix theory, even if also a novice to vibration theory, should have little difficulty in reading the matrix chapters on his own and getting a limited but good introduction to the theory and to the computational techniques.

A. S. H.

33[P, X].—C. T. Leondes, Editor, *Advances in Control Systems, Theory and Applications*, Academic Press, Inc., New York, 1964, x + 365 p., 24 cm. Price $13.00.

This is the first of a series the purpose of which is "to disseminate current information from leading researchers in the ever broadening field of automatic control." It is to consist of a collection of "critical and definitive reviews" at a level between a journal and a monograph covering both theory and applications.

Volume I contains six contributions:

1. "On optimal and suboptimal policies in control systems," by Masano Aoki (pp. 1–53). The control system is disturbed by random noise. If the distribution function of the noise is known, it is called a "stochastic" control problem. If less information is given, it is called an "adaptive" control problem. A review is given of the linear theory of such systems.

2. "The Pontryagin maximum principle and some of its applications," by James A. Meditch (pp. 55–74). The maximum principle and its application to the design of systems is described and illustrated.

3. "Control of distributed parameter systems," by P. K. C. Wang (pp. 75–172). The extension of the theory for lumped parameter systems (ordinary differential equations) to distributed parameter systems (partial differential equations or integral equations) and the difficulties are discussed.

4. "Optimal control for systems described by difference equations," by Hubert Halkin (pp. 173–196). This contribution provides in the simpler context of difference equations an introduction to the geometrical and topological method in the theory of optimal control and includes a proof of the maximum principle for difference equations.

5. "An optimal control problem with state vector measurement errors," by Peter R. Schultz (pp. 197–243). The problem discussed is a linear stochastic one with a quadratic performance criterion, and its study is based on the method of dynamic programming.

6. "On line computer control techniques and their application to re-entry aerospace vehicle control," by Francis H. Kishi (pp. 245–557). Methods available "to perform adaption in a control process" are based on observation of input-output data, the estimation of parameter values and state-variables, and thence the computation of optimal control. Methods available for the linear problem with quadratic performance criteria are summarized and then extended to the same problem with control constraints. Results of computer simulation are given. An application to a phase of the re-entry problem is presented in outline.

This first volume indicates that the series will prove to be of considerable value to all concerned with the theory and design of control systems and with the education of system engineers. The chapters are written independently and this results in much repetition, particularly in the statement and review of the control problem. This has both advantages and disadvantages, but it is to be hoped that the contributors to Volume II will, with the appearance of Volume I, avoid needless repetition and the introduction of new terminology, and that they will relate their contributions to those previously appearing in the series.

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34[P, Z].—M. Nadler, *Topics in Engineering Logic*, Pergamon Press, New York, 1962, ix + 231 pp., 21 cm. Price $9.50.

Too often simplified notations and methods of procedure are not sufficiently emphasized in the literature. Indeed, as Nadler states ". . . the history of mathematics shows that progress is not indifferent to notation." This remark is particularly apropos when applying mathematical results to modern technological problems. There are many instances in the history of modern technology in which mathematical results that could be applied with great benefit are not so applied, simply because of the lack of proper notations and procedures.

The need for such notation arises from three reasons. First, the engineer or